Studying microbial pathogenesis and bacterial diseases

B Brett Finlay speaks to Hannah Branch, Commissioning Editor

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B Brett Finlay is Professor in the Michael Smith Laboratories in addition to the Departments of Microbiology and Immunology, and Biochemistry and Molecular Biology at the University of British Columbia, Canada. He received a BSc (Honors) and a PhD (1986) in biochemistry at the University of Alberta, Canada. In 1989, he started work as Assistant Professor in the Biotechnology Laboratory at the University of British Colombia. He has focused his research on host–pathogen interactions at the molecular level. He has been at the forefront of the cellular microbiology field and contributed towards a number of important discoveries in this area while publishing over 400 manuscripts. Research in his laboratory is focused on, but not restricted to, *Escherichia coli* and *Salmonella* interactions with host cells. He is known across the globe for his research and has been honored with a number of prestigious awards, including the EWR Steacie Prize, the Canadian Society of Microbiology Fisher Scientific Award, a Medical Research Council scientist award, five Howard Hughes International Research Scholar Awards, a Canadian Institute of Health Research Distinguished Investigator award, British Columbia Biotech Innovation Award, the Michael Smith Health Research Prize, the Infectious Diseases Society of America Squibb award and the Jacob Biely Prize. He is a Fellow of the Royal Society of Canada and the Canadian Academy of Health Sciences, is an Officer of the Order of Canada, and is the University of British Columbia Peter Wall Distinguished Professor. He cofounded Inimex Pharmaceuticals, Inc. (BC, Canada), and is Director of the Severe Acute Respiratory Syndrome Accelerated Vaccine Initiative. He is also a valued member of several advisory and editorial boards, including that of *Future Microbiology*.

■ **You have an extensive educational history studying at the University of Alberta (Canada) & Stanford University School of Medicine (CA, USA). When did you decide to focus your research on host–pathogen interactions?**

I started my PhD studying bacterial F-plasmid conjugation (bacterial sexual predoruction) in Bill Paranchych's laboratory in Alberta (Canada). He was interested in bacterial adherence structures in general, including bacterial pili and fimbriae. Hence, the laboratory was also studying adherence of bacterial pathogens, which interested me a lot. At that time, genetics and recombinant DNA had been limited to bacteria and was just emerging for eukaryotes, so everyone was jumping on the 'eukaryote' bandwagon. I really liked microbes, so figured I would try and get the best of both worlds by studying bacterial interactions with mammalian cells for my postdoctorate in Stanley Falkow's laboratory at Stanford School of Medicine.

■ **What, in particular, interests you about host–pathogen interactions at the molecular level?**

I really enjoy the 'collision' between microbiology and cell biology. Microbiologists rarely think about mammalian cells, and cell biologists do everything they can to avoid microbes (e.g., antibiotics in tissue culture media). Although there are a lot of good microbiologists and cell biologists, it takes an unusual attitude to work on the problem from both sides, which is very rewarding.

■ **What do you consider to be the most significant research you have conducted so far & why?**

Our single biggest discovery was published in *Cell* in 1997 when we showed that pathogenic *Escherichia coli* actually injected its own receptor (Tir) into mammalian cells, allowing a bacterial outer membrane protein (intimin) to bind to Tir and nucleate the underlying mammalian cytoskeleton [1]. The concept that a pathogen injected its own receptor into host cells was unprecedented. This

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discovery, and others related to it, allowed us to develop and commercialize a bovine vaccine to *E. coli* O157 that decreases this pathogen in cows, thereby virtually eliminating this pathogen from food and water sources.

■ **What made you focus your studies more on *Salmonella* & *E. coli*?**

I chose to focus my studies on these organisms because: they remain major pathogens; they are not as dangerous as others to work on; and there was already a lot known about their basic biology, thus one could carry out molecular biology on them.

■ **You have also been conducting research on microbiota. Could you please explain how this is impacting microbiology & how it could result in the field evolving in the future?**

I strongly believe that microbiota are taking biology by storm. Although we have known about their existence for approximately 350 years, only within the past 5 years are we truly beginning to appreciate the profound impact that they have on health and disease. It is embarrassing as a microbiologist to think that we ignored these microbes for so long, but are now realizing they play a major role in human biology.

■ **You have won a number of awards, including five Howard Hughes International Research Scholar Awards. Which would you say represents your greatest achievement & for what reason?**

Awards are nice, but should really be thought of as tributes to all of the people who work in our laboratory; I just happen to be the fortunate one who gets credit. I'm most proud of being an Officer of the Order of Canada, as this is the equivalent of Canadian knighthood, and the list of recipients is truly stunning, with such talented individuals making such great contributions to all aspects of life.

■ **How important do you believe it is to communicate science & microbiological research & discoveries to the public & why?**

I strongly believe that, as scientists, it is our critical duty to communicate science at every possible opportunity. We are paid by the public to do our science, which is a real privilege, and so we owe it to society to increase their knowledge about science so that they can appreciate what we are doing and its potential for benefiting society.

■ **In your opinion, what is the most important piece of technology relating to your research & why?**

As discussed above, being able to discover, develop and then successfully commercialize a bovine *E. coli* O157 vaccine has been wonderful. The concept that work we do can lead to a decrease in disease and deaths due to a pathogen is absolutely rewarding.

■ **How do you hope your research field will evolve over the next 5–10 years?**

I believe that the microbiota field will begin to mature, and we will identify microbes and even microbiota molecules that can be harnessed to impact on human health and disease.

■ **If resources & practicalities were not limitations, what research would you like to conduct & why?**

I would like to combine the work we do on microbiota and intestinal bacterial pathogens, in order to come up with useful ways to decrease enteric diseases using knowledge gained from the microbiota.

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Reference

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